Do turning visited routes in black maps into white promote sightseeing? *

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Abstract. In this paper, we propose a new approach for promoting visiting various areas during a sightseeing based on the "FUrther BENEfit of a Kind of Inconvenience" (FUBEN-EKI) theory. FUBEN-EKI is a theory such that an inconvenient system in some aspect enables users to obtain more hidden benefits than convenient systems. Familiar navigation systems lead tourists to time efficient routes, and so the systems may limit their opportunities for new discoveries during their sightseeing. It is supposed that if tourists walk freely in various areas then they will have more change to find new discoveries. To promote visiting various areas, we propose a blacked-out map: The map is hidden by a black filter initially, but only the area where the user moves becomes clear. Since the user cannot see the map of unvisited area, the user thinks that the unvisited area might have interesting sightseeing spots. Moreover, to make all of the area clear, the user have to go to all of the area on the map.

INTRODUCTION

A map or a navigation system is one of the essential tools for tourists in order to enjoy their sightseeing. By using these tools, tourists reach a destination without losing their way in an unfamiliar area. To support tourists' sightseeing, many navigation systems place a high value on efficiency. For example, some system shows the optimal and shortest route to a destination from a current position [1], and some system shows the information about recommended sightseeing spots for the tourists. These systems are very convenient for tourists who visit a sightseeing spot that they are unfamiliar with. However, tourists who use such systems tend to follow the route or the recommendation proposed by the system, and they have less opportunity for new discoveries.

On the other hand, there are benefits which have been overlooked in the pursuit of efficiency. These benefits have been regarded as a minor factor in trends of recent years, but are now beginning to gain attention as the theory of the "FUrther BENEfit of a Kind of Inconvenience" (FUBEN-EKI) [2]. Using a system that is inconvenient in some aspect enables users to obtain more hidden benefits than existing convenient systems which satisfy our demands efficiently.

In the research area about navigation systems, there are some studies that try to give tourists chances of new discoveries based on the FUBEN-EKI. Nakatani et al. [3] proposed a sightseeing navigation system in which a user writes a sightseeing plan and its routes by hand before his/her sightseeing, and then uses it as a reference during his/her sightseeing. Since the handwritten routes have many distortions, the user cannot know the exact routes on site. Moreover, Takagi et al. [4] developed a system that navigates users only using information on direction and spots that are scattered throughout the tourist's destination, without any detailed map information. As for a map system, Kitagawa et al. [5] proposed a map which degrades information on a map where a user visits repeatedly. Since the user cannot see the information for the visited area clearly, the user looks the environment around him carefully. These systems restrict map information given to tourists in order to promote interaction with environment.

In this paper, we propose a new approach for promoting visiting various areas during sightseeing based on the FUBEN-EKI theory. If tourists use the efficient navigation system above, most of them follows the recommended route. However, it is supposed that if tourists walk freely in various areas then they will have more change to find new discoveries. To promote visiting various areas, we propose a blacked-out map: The map is hidden by a black

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TABLE 1. The systems the evaluators used in each area.

	First trial	Second trial	Third trial one week later
Group I	Our system / area 1	General System / area 2	Our system / area 1
Group II	General system / area 1	Our system / area 2	Our system / area 2

filter initially. So, a user cannot see the information on the map. After the user moves in the area on the map, only the area the user moved becomes clear. That is, the user can see the information on the map for the area on the movement history of the user. The blacked-out map is inconvenience because it provides less information, but it may give opportunities for moving other blacked-out areas to tourists because they do not know even whether the blacked-out areas have interesting sightseeing spots or not. In this paper, we show the evaluation results using our proposal system.

PROPOSED SYSTEM

In our study, our goal is to promote visiting various areas during a sightseeing. To achieve this goal, we propose a map system which outputs areas tourists have not visited yet. In the general map system based on this idea, a history of tourists' movement is shown on a map. So, tourists can know which streets they followed and which areas they visited. Moreover, the tourists can know the information about the area they have not visited because the information on map is provided to them. In this case, the tourists may decide their next action or destination based on the information on map. To lead the tourists to unvisited areas regardless of the their prejudices, our system hides the information on map.

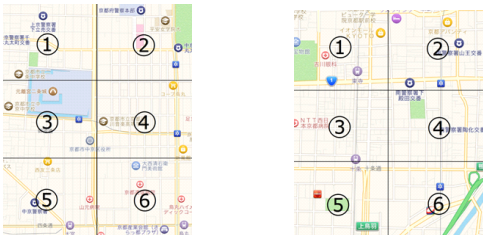
In our system, a map are initially covered by a black filter. Then, if a user moves in an area on the map, the filter makes a hole around the area. That is, the user can see the information on the map for the visited area, and know the history of his/her movement. Since the map for the unvisited area is kept being covered by the black filter, the user cannot know the map information for there. There are two our aims in this system: One is that the user thinks the unvisited area might have some interesting sightseeing spots because the user has no information about there. The other is that the history of user's movement promotes a sense of user's accomplishment. The user may visit various areas because the user wants to see all of the map.

We developed the prototype system based on the idea above. We used a tablet as a mobile device because a tablet has larger size of screen than a smart phone. As a map, we used the map which installed in the tablet initially as an application. The system screens are shown in Figure 2 and 3 in the next section.

EVALUATION

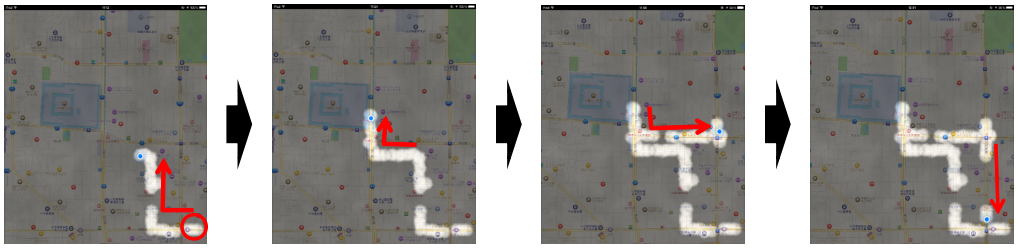
Experimental Procedure

To evaluate the impact of our proposal system, we conducted the experiment with the cooperation of eight evaluators (five males and three females), who were not familiar with the experiment areas, in December, 2014. They were divided to two groups; **group I** consists of three males and one female, and **group II** consists of two males and two females. We set the two sightseeing areas in this experiment: One is the area around Nishinokyo in the central area of Kyoto (we call the area **area 1**), and the other is the area around Higashi-kujo in the south area of Kyoto (we call the area **area 2**). These areas are shown in Figure 1. Both of them have about 2.5km of North-South side and 2km of Ease-West side. The whole map of each area is shown in the display on the tablet (that is, the evaluators have not to scroll the display to see the map). For comparison, we used the map application, which does not provide the history of user's movement, installed in the tablet initially. The information on the maps both in our system and the application are same. On the first evaluation day, in area 1, the evaluators in group I used our system, and the evaluators in group II used the map application After that, in area 2, group I used the map application, and group II used our system. In each area, we requested them to enjoy their sightseeing freely using the map systems in about two hours. After their sightseeing, we requested them to answer our questionnaire. To see the effect when a user visits the sightseeing area using our system again, the group I visited area 1 and group II visited area 2 again one week later, and they enjoyed their sightseeing using our system in about two hours. In this experiment, the histories of user's movement in the first experiment are shown on the map. Table 1 summarizes the systems the evaluators used in each area.

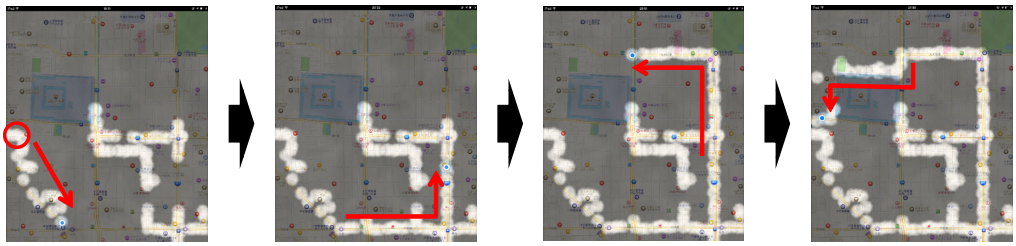


(a) Area 1 (b) Area 2

FIGURE 1. The two evaluation areas and the spot numbers.



(a) The first day



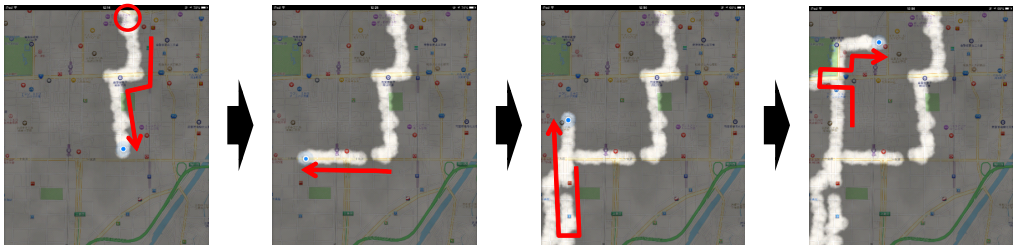
(b) The second day

FIGURE 2. The movement histories for the area 1 on the first day (a) and the second day (b).

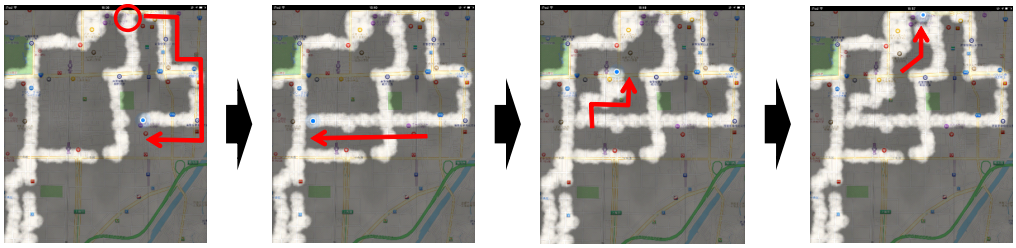
Experiment Results

Figure 2 and 3 show the movement histories of each groups using our system on the first and the second day. The histories are shown by the continuous white hole. In some points, the histories are disconnected because of missing GPS data. In each display in Figure 2 and 3, the circle shows the start point, and the arrow shows the direction of the movement. Table 2 shows the answers of the evaluators for two questions in the questionnaire. In the table, the evaluators are labeled by A-H (A-D belong to group I, and E-H belong to group II). The first question (**Q1**) we asked to the evaluators is ”Did you want to visit the area again? (answer 5-point scale, 1 is strong negation and 5 is strong affirmation)”, and the second one (**Q2**) is ”Which spot do you want to visit when you come again here?”. For the Q2, they answered the corresponding numbers to spots in Fig. 1.

Except the evaluator D and G, the other evaluators answered a positive point for the Q1 for our system. While the evaluator G and H answered the same point for the both systems, the other evaluators answered better points for our system than for the general one. The average point of answers for Q1 for our system is 3.875 and the one for the general map is 2.875. As the figure 2 shows, for the area 1, the evaluators in the group I did their sightseeing in the spot 4 and 6 on the first day. Then for the Q2, the most of the evaluators in the group I answered spot 1, 2, 5. Actually, they visited the spot 2, 3, 5 on the second day. For the group II who visited area 2 using our system, they visited various spots on the first day (see Fig. 3(a)). So, they did not list up the more numbers of spots for the Q2 than the group I. For the Q2, all of the evaluators in the group II answered spot 6 because they did not go to the spot on the first day. However, on the second day, they did not go to the spot 6.



(a) The first day



(b) The second day

FIGURE 3. The movement histories for the area 2 on the first day (a) and the second day (b).

TABLE 2. The answers for the questionnaire.

			A/E	B/F	C/G	D/H
Q1	Our system	Area 1	5	4	4	3
		Area 2	5	4	2	4
	General map	Area 1	4	3	2	4
		Area 2	4	3	1	2
Q2	Our system	Area 1	1, 3, 5	2	1, 2, 5	1, 2, 3, 4, 5
		Area 2	5, 6	3, 6	6	2, 4, 6
	General map	Area 1	1, 2, 6	6	3, 5	2
		Area 2	1, 6	4	1, 6	2

The movement histories, especially for area 2, show that the evaluators using our system visited various spots in the map. In addition, they said they wanted to visit the sightseeing area again and go the unvisited spots. The numbers of answered spots for the Q2 in the case using our system are greater than ones in the case using the general maps. The evaluators in the group I, actually, visited the answered spots on the second day. Therefore, it can be said that the turning the blacked-out map to white promotes visiting unvisited spots.

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